



SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'A' grade by NAAC)

M.Sc. MATHEMATICS – SYLLABUS

(Under CBCS based on OBE)

(For the students admitted from the academic year 2024 – 2025 onwards)

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The M.Sc., Mathematics Graduates of the Sourashtra College will:

PEO 1	gain knowledge in foundational areas of Mathematics
PEO 2	communicate Mathematics accurately, precisely and effectively.
PEO 3	develop Mathematical thinking.
PEO 4	apply Mathematical knowledge.
PEO 5	be able to solve Mathematical problems using technology.
PEO 6	develop teaching skills, subject knowledge in the course of the study which will them to shine in various fields including education, IT sector etc.,

POSTGRADUATE (PG) PROGRAMME OUTCOMES (POs)

PO 1	Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study
PO 2	Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO 3	Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
PO 4	Analytical Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints.
PO 5	Scientific Reasoning: Ability to analyse, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.
PO 6	Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.



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PROGRAMME SPECIFIC OUTCOMES (PSOs)

Upon completion of M.Sc., Mathematics, the students are expected /will be able to

PSO1	acquire good knowledge and understanding, to solve specific theoretical & applied problems in different area of mathematics & statistics.
PSO2	understand, formulate, develop mathematical arguments, logically and use quantitative models to address issues arising in social sciences, business and other context /fields.
PSO3	demonstrate respectful engagement with others' ideas, behaviours, beliefs and apply diverse frames of references to decisions and actions.
PSO4	become effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.
PSO5	use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
PSO6	have practices grounded in research that comply with employment laws, leading the organization towards growth and development.

DISTRIBUTION OF CREDITS (PG PROGRAMME)

SEMESTER	COURSES	NUMBER OF COURSES	HOURS	CREDITS	TOTAL CREDITS
I-IV	CORE	13	6	4-5	61
IV	CORE PROJECT	1	5	5	5
I-IV	ELECTIVE	5	4-6	3-4	16
III	NON MAJOR ELECTIVE (NME)	1	6	4	4
II-IV	SEC (SKILL ENHANCEMENT COURSE)	3	2-4	2	6
III	INTERNSHIP/ INDUSTRIAL ACTIVITY	1		2	2
TOTAL					94

*Extra credits may be earned through SWAYAM Courses/other online courses



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M.Sc. MATHEMATICS – COURSE STRUCTURE

SEMESTER – I

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24PMSC11	Core – 1: Algebra – I	6	3	25	75	100	4
2	24PMSC12	Core – 2: Analysis – I	6	3	25	75	100	4
3	24PMSC13	Core – 3: Discrete Mathematics	6	3	25	75	100	4
4	24PMSC14	Core – 4: Topology	6	3	25	75	100	4
5	24PMSE11	Elective – 1:* Graph Theory and Applications	6	3	25	75	100	4
	24PMSE12	Elective – 2:* Mathematical Programming	6	3	25	75	100	
		TOTAL	30				500	20

*One elective be chosen from Elective 1 and Elective 2

SEMESTER – II

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	24PMSC21	Core – 5: Linear Algebra	6	3	25	75	100	5
2.	24PMSC22	Core – 6: Real Analysis II	6	3	25	75	100	5
3.	24PMSC23	Core – 7: Ordinary Differential Equations	6	3	25	75	100	5
4.	24PMSE21	Elective – 3:* Mathematical Statistics	4	3	25	75	100	3
	24PMSE22	Algebraic Topology						
5.	24PMSE23	Elective – 4:* Number Theory and Cryptography	4	3	25	75	100	3
	24PMSE24	Modelling and simulation with Excel						
6.	24PMSS21	SEC: Office Automation and ICT Tools	4	Internal Assessment Max. Marks 100			100	2
		TOTAL	30				600	23

*One elective course to be chosen from TWO courses

*All students will do internship after II Semester. The evaluation will be done in the beginning of III Semester and marks will be included in the III Semester mark sheet.

Passed in the BoS Meeting held on 27/02/2025

Signature of the Chairman



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SEMESTER – III

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24PMSC31	Core – 8 : Complex Analysis	6	3	25	75	100	5
2	24PMSC32	Core – 9: Differential Geometry	6	3	25	75	100	5
3	24PMSC33	Core – 10: Partial Differential Equations	6	3	25	75	100	5
4	24PMSE31	Elective – 5: * Stochastic Processes	4	3	25	75	100	3
	24PMSE32	Algebraic Number Theory						
5	24PMSN31	Extra Disciplinary Course : NME – Statistics for Life and Social Sciences (Non-Mathematics students)	6	2	25	75	100	4
	24PMSN32	Celestial Science (Mathematics students)						
6	24PMSS31	SEC: Professional Communication Skill	2	Internal Assessment Max. Marks 100			100	2
7	24PMSP31	Internship/Industrial Activity	–	–	–	–	100	2
		TOTAL	30				700	26

* Choose any one subject from Elective 5

SEMESTER – IV

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24PMSC41	Core – 11 : Functional Analysis	6	3	25	75	100	5
2	24PMSC42	Core – 12: Probability Theory	6	3	25	75	100	5
3	24PMSC43	Core – 13: Mechanics	6	3	25	75	100	5
4	24PMSCV1	Core – 14: Project with Viva–Voce	5	3	40	60	100	5
5	24PMSE41	Elective – 6*: Resource Management Techniques	4	3	25	75	100	3
	24PMSE42	Financial Mathematics						
6	24PMSS41	SEC: Professional Competency Skill Enhancement course	3	Internal Assessment Max. Marks 100			100	2
		TOTAL	30				600	25

* Choose any one subject from Elective 6

Credits: 20 + 23 + 26 + 25 = 94

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COURSE STRUCTURE – III SEMESTER

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24PMSC31	Core – 8 : Complex Analysis	6	3	25	75	100	5
2	24PMSC32	Core – 9: Differential Geometry	6	3	25	75	100	5
3	24PMSC33	Core – 10: Partial Differential Equations	6	3	25	75	100	5
4	24PMSE31	Elective – 5: * Stochastic Processes	4	3	25	75	100	3
	24PMSE32	Algebraic Number Theory						
5	24PMSN31	Extra Disciplinary Course : NME – Statistics for Life and Social Sciences (Non-Mathematics students)	6	2	25	75	100	4
	24PMSN32	Celestial Science (Mathematics students)						
6	24PMSS31	SEC: Professional Communication Skill	2	Internal Assessment Max. Marks 100			100	2
7	24PMSP31	Internship/Industrial Activity	–	–	–	–	100	2
		TOTAL	30				700	26

* Choose any one subject from Elective 5

CA – Class Assessment (Internal)

SE – Summative Examination

SEC – Skill Enhancement Course

NME – Non – Major Elective

T – Theory

P – Practical



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSC31	COMPLEX ANALYSIS	CORE – 8	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability		✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local		Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

This course is designed to learn analysis concepts and complex numbers.

COURSE OBJECTIVES:

To study the properties of complex numbers, Stereographic projection, Cauchy's integral formula, general form of Cauchy's theorem, evaluation of definite integral and harmonic functions.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	describe the concept of basic properties of complex numbers and stereographic projections	Upto K5
CO 2	analyze and evaluate local properties of analytical functions and definite integrals.	Upto K5
CO 3	demonstrate the concept of the general form of Cauchy's theorem.	Upto K5
CO 4	describe the concept of definite integral and harmonic functions.	Upto K5
CO 5	describe Taylor and Laurent series.	Upto K5

K1–KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4–ANALYSE, K5–EVALUATE



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COMPLEX ANALYSIS

UNIT– I:

The algebra of complex numbers – The geometric representation of complex numbers

Chapter 1: Section 1, 2

UNIT– II:

Cauchy's Integral Formula: The Index of a point with respect to a closed curve – The Integral formula – Higher derivatives. Local Properties of analytical Functions: Removable Singularities–Taylors's Theorem – Zeros and poles – The local Mapping – The Maximum Principle.

Chapter 4: Section 2 : 2.1 to 2.3

Chapter 4: Section 3 : 3.1 to 3.4

UNIT– III:

The general form of Cauchy's Theorem: Chains and cycles– Simple Continuity – Homology – The General statement of Cauchy's Theorem – Proof of Cauchy's theorem – Locally exact differentials– Multiply connected regions – Residue theorem – The argument principle.

Chapter 4: Section 4: 4.1 to 4.7

Chapter 4: Section 5: 5.1 and 5.2

UNIT– IV:

Evaluation of Definite Integrals and Harmonic Functions: Evaluation of definite integrals – Definition of Harmonic function and basic properties – Mean value property – Poisson formula.

Chapter 4: Section 5: 5.3

Chapter 4: Section 6: 6.1 to 6.3

UNIT– V:

Harmonic Functions and Power Series Expansions: Schwarz theorem – The reflection principle – Weierstrass theorem – Taylor's Series – Laurent series

Chapter 4: Sections 6.4 and 6.5

Chapter 5: Sections 1.1 to 1.3

TEXT BOOK:

Lars V. Ahlfors, *Complex Analysis*, (3rd edition) McGraw Hill Co., New York, 1979

REFERENCE BOOKS:

1. H.A. Presfly, *Introduction to Complex Analysis*, Clarendon Press, oxford, 1990.
2. J.B. Conway, *Functions of One Complex Variables* Springer – Verlag, International student Edition, Naroser Publishing Co.1978

DIGITAL TOOLS:

<http://www.opensource.org>

<http://en.wikipedia.org>

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	3	1	3	2
CO2	1	3	1	3	1	1
CO3	3	2	1	2	2	1
CO4	1	1	2	1	3	2
CO5	2	2	3	3	3	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSC32	DIFFERENTIAL GEOMETRY	CORE – 9	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local	Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender	Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

This course is designed to teach various concepts and applications in Differential Geometry.

COURSE OBJECTIVES:

This course introduces space curves and their intrinsic properties of a surface and geodesics. Further the non-intrinsic properties of surface and the differential geometry of surfaces are explored

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand about space curves, Serret Frenet formula, curvature and torsion of a curve.	Upto K5
CO 2	find involutes and evolutes, intrinsic equations and fundamental existence theorem for space curves.	Upto K5
CO 3	compose problems on Surface of revolution & Helicoids.	Upto K5
CO 4	recognize the direction coefficients & Intrinsic properties.	Upto K5
CO 5	construct and analyze the problems on Geodesic curvature.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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DIFFERENTIAL GEOMETRY

UNIT– I:

Space curves: Definition of a space curve – Arc length – tangent – normal and binormal – Serret Frenet formula–curvature and torsion of a curve.

Chapter – 1 Section: 1 to 5

UNIT– II:

Contact between curves and surface–tangent surface– involutes and evolutes– Intrinsic equations – Fundamental Existence Theorem for space curve.

Chapter – 1 Section: 6 &7

UNIT– III:

Helices – Definition of a surface–curves on a surface–surface of revolution–Helicoids– (Simple problems only)

Chapter 1– Section: 9 & Chapter – 2 Section: 1to 4

UNIT– IV:

Metric–direction coefficients–families of curves–orthogonal trajectories—Intrinsic properties.

Chapter – 2 Section: 5 to 7 & 9

UNIT– V:

Geodesics–canonical geodesic equations–normal property of geodesics–Geodesic curvature–Liouville's formula.The second fundamental form.

Chapter – 2 Section: 10 to 12, 15 & Chapter – 3 Section: 1,2

TEXT BOOK:

T.J.Willmore, *An Introduction to Differential Geometry*, Oxford University Press,(17th Impression) New Delhi 2002. (Indian Print)

REFERENCE BOOKS:

1. Struik, D.T. *Lectures on Classical Differential Geometry*, Addison – Wesley, Mass. 1950.
2. Somasundram D, *Differential Geometry*, Narosa publishing House, Chennai, 2014

DIGITAL TOOLS:

<http://mathforum.org>,
<http://ocw.mit.edu/ocwweb/Mathematics>,
<http://www.opensource.org>,
www.physicsforum.com

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	3	1	3	1
CO2	1	3	1	3	1	2
CO3	3	2	2	2	2	1
CO4	1	1	1	1	1	2
CO5	2	3	3	3	3	1

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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSC33	PARTIAL DIFFERENTIAL EQUATIONS	CORE – 10	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local		Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values	Other Values ✓

COURSE DESCRIPTION:

The course is designed to learn various concepts and method used in PDE.

COURSE OBJECTIVES:

To classify the second order partial differential equations and to study Cauchy problem, method of separation of variables, boundary value problems.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand and classify second order equations and find general solutions.	Upto K5
CO 2	analyse and solve wave equations.	Upto K5
CO 3	solve Vibrating string problem, Heat conduction problem, existence and uniqueness of solution of heat conduction problem.	Upto K5
CO 4	form PDE by eliminating arbitrary constants and functions and solving PDE by Lagrange's method.	Upto K5
CO 5	know about orthogonal surfaces and check the given PDE's are compatible or not and solving PDE by Charpit's method.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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PARTIAL DIFFERENTIAL EQUATIONS

UNIT– I: MATHEMATICAL MODELS AND CLASSIFICATION OF SECOND ORDER EQUATION

Classical equations–Vibrating string – Vibrating membrane – waves in elastic medium – Conduction of heat in solids – Gravitational potential – Second order equations in two independent variables – canonical forms – equations with constant coefficients – general solution

Text Book 1 : Chapter 3 : Sections 3.1 to 3.6

Text Book 1 : Chapter 4 : Sections 4.1 to 4.4 (Omit 4.5)

UNIT– II: CAUCHY PROBLEM

The Cauchy problem – Cauchy Kowalewsky theorem – Homogeneous wave equation – Initial Boundary value problem– Non–homogeneous boundary conditions – Finite string with fixed ends – Non–homogeneous wave equation – Riemann method – Goursat problem.

Text Book 1 : Chapter 5 : Sections 5.1 to 5.9

UNIT– III: METHOD OF SEPARATION OF VARIABLES

Separation of variable Vibrating string problem – Existence and uniqueness of solution of vibrating string problem – Heat conduction problem – Existence and uniqueness of solution of heat conduction problem.

Text Book 1 : Chapter 7 : Sections 7.1 to 7.5

UNIT– IV: PARTIAL DIFFERENTIAL EQUATIONS

Partial Differential Equation – origin of first order PDE – Linear equations of first order – Lagrange's equations – theorems – problems – integral surfaces passing through a given curve – problems.

Text Book 2 : Chapter 2 : Sections 2.1, 2.2, 2.4, 2.5.

UNIT– V: ORTHOGONAL AND COMPATIBLE SYSTEMS

Surfaces orthogonal to a given system of surfaces – problem – compatible systems of first order equations – condition for compatibility of two partial differential equations – problem – Charpit's equation – solving PDEs by Charpit's method.

Text Book 2 : Chapter 2 : Sections 2.6, 2.9, 2.10, 2.11

TEXT BOOKS:

1. TynMyint–U and Lokenath Debnath, *Partial Differential Equations for Scientists and Engineers (Third Edition)*, North Hollan, New York, 1987.
2. I.N. Sneddon, *Elements of Partial Differential Equations*, McGraw Hill, New Delhi, 1983



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REFERENCE BOOKS:

1. M.M.Smirnov, *Second Order partial Differential Equations*, Leningrad, 1964.
2. R. Dennermeyer, *Introduction to Partial Differential Equations and Boundary Value Problems*, McGraw Hill, New York, 1968.
3. M.D.Raisinghania, *Advanced Differential Equations*, S.Chand & Company Ltd., New Delhi, 2001.
4. S, Sankar Rao, *Partial Differential Equations*, 2nd Edition, Prentice Hall of India, New Delhi. 2004

DIGITAL TOOLS:

<http://mathforum.org>,
<http://ocw.mit.edu/ocwwweb/Mathematics>,
<http://www.opensource.org>,
www.mathpages.com

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	3	2	3	2
CO2	2	1	3	1	3	1
CO3	3	2	3	1	3	2
CO4	1	2	3	2	3	1
CO5	3	1	2	3	3	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSE31	STOCHASTIC PROCESSES	ELECTIVE – 5	4	–	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local	Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender	Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

This course covers the theory and practical applications of stochastic processes which are collections of random variables indexed by time or space.

COURSE OBJECTIVES:

To introduce a wide variety of stochastic processes and their applications.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	acquire in-depth knowledge about a stochastic processes and Markov chains	Upto K5
CO 2	discuss the transition probabilities, Chapman Kolmogorov equation.	Upto K5
CO 3	understand the concept of classification of states of Markov chain	Upto K5
CO 4	understand the concept of Markov process with discrete state space, Poisson process and its properties.	Upto K5
CO 5	understand the concept of Pure Birth and Death Process.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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STOCHASTIC PROCESSES

UNIT– I:

Introduction – Definition of stochastic process – Specification of stochastic process – Markov chains and examples – Transition matrix or Matrix of Transition Probabilities – simple problems and examples – Stochastic matrix and example of Non-Markov chain – Polya's Urn model.

Chapter 1: Sections 1.5, 1.5.1 and Chapter 2: Sections 2.1, 2.1.1, 2.1.1.1 Page no. 49–51 and 60–65, 68.

UNIT– II:

Higher Transition Probabilities – Chapman Kolmogorov equation – Simple example problems – Generalisations of independent Bernoulli trials – sequence of chain independent trials and simple problems only.

Chapter 2: Sections 2.2 – 2.4 Page no. 70–75 and 78

UNIT– III:

Classification of states of Markov chain – irreducible Markov chain – class property – Definitions of Return state – Periodic and Aperiodic state – Transient and Persistent – Null Persistent – Non null Persistent – Ergodic state – Ergodic theorem and simple problems only.

Chapter 2: Sections 2.4, 2.4.1 – 2.4.4 and theorem 2.7. Page no 78–82, 95–97.

UNIT– IV:

Markov process with discrete state space – Poisson process – Postulates for Poisson process – Solution of Poisson process and simple problems – Properties of Poisson process.

Chapter 3: Sections 3.1, 3.1.2, 3.1.3 Page no. 138 – 145.

UNIT– V:

Pure Birth Process – Yule – Furry process and the probabilities $P_n(t)$ – Mean and Variance – Birth and Death process – Derivation of the Differential Equation of Birth Death process and simple problems.

Chapter 3: Sections 3.3.3, 3.4. Page no 158 – 161, 165 and 166.

TEXT BOOK:

J. Medhi, *Stochastic Processes*, 3rd Edition, New age international Private limited, New Delhi, 2006

REFERENCE BOOKS:

1. K. Basu, *Introduction to Stochastic Process*, Narosa Publishing House, New Delhi, 2003
2. Goswami & B. V. Rao, *A Course in Applied Stochastic Processes*, Hindustan Book Agency, New Delhi, 2006
3. G. Grimmett & D. Stirzaker, *Probability and Random Processes*, 3rd Ed., Oxford University Press, New York, 2001

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1	2	1	2
CO2	3	1	1	2	1	1
CO3	3	1	1	2	1	1
CO4	3	1	1	2	1	1
CO5	3	1	1	2	1	2

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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSE32	ALGEBRAIC NUMBER THEORY	ELECTIVE – 5	4	–	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability		✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local		Regional		Global		
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values		Other Values
									✓

COURSE DESCRIPTION:

This course is designed to understand the concept of types of rings and fields.

COURSE OBJECTIVES:

The course aims to provide a study on modules over rings, finite fields, algebraic extensions, number fields and cyclotomic fields, Noetherian rings and modules and Dedekind rings

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the concept of Modules	Upto K5
CO 2	deal with algebraic integers and its applications	Upto K5
CO 3	understand the concept of Quadratic fields and cyclotomic fields	Upto K5
CO 4	learn Ramanujan–Nagell Theorem	Upto K5
CO 5	understand Prime Factorization of Ideals	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE



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ALGEBRAIC NUMBER THEORY

UNIT– I:

Rings and Fields– Factorization of Polynomials – Field Extensions – Symmetric Polynomials – Modules – Free Abelian Groups.

Chapter 1: Sec. 1.1 to 1.6

UNIT– II:

Algebraic numbers – Conjugates and Discriminants – Algebraic Integers – Integral Bases – Norms and Traces – Rings of Integers.

Chapters 2: Sec. 2.1 to 2.6

UNIT– III:

Quadratic fields and cyclotomic fields – Factorization into Irreducibles – Trivial factorization – Factorization into irreducibles – Examples of non-unique factorization into irreducibles.

Chapter 3: Sec. 3.1 and 3.2 **Chapter 4:** Sec. 4.2 to 4.4

UNIT– IV:

Prime Factorization – Euclidean Domains – Euclidean Quadratic fields – Consequences of unique factorization – The Ramanujan–Nagell Theorem.

Chapter 4: Sec. 4.5 to 4.9

UNIT– V:

Prime Factorization of Ideals – The norms of an Ideal – Nonunique Factorization in Cyclotomic Fields.

Chapter 5: Sec. 5.2 to 5.4

TEXT BOOKS:

I. Steward and D.Tall, *Algebraic Number Theory and Fermat's Last Theorem (3rd Edition)* A.K.Peters Ltd., Natrick, Mass. 2002.

REFERENCE BOOKS:

1. Z.I.Bosevic and I.R.Safarevic, *Number Theory*, Academic Press, New York, 1966
2. J.W.S.Cassels and A.Frohlich, *Algebraic Number Theory*, Academic Press, New York, 1967
3. P.Ribenboim, *Algebraic Numbers*, Wiley, New York, 1972
4. P. Samuel, *Algebraic Theory of Numbers*, Houghton Mifflin Company, Boston, 1970
5. Weil. *Basic Number Theory*, Springer, New York, 1967.

DIGITAL TOOLS:

<http://mathforum.org>, <http://ocw.mit.edu/ocwweb/Mathematics>
<http://www.opensource.org>, www.algebra.com

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	2	2	1
CO2	2	2	2	2	3	2
CO3	2	2	1	2	2	1
CO4	1	2	2	1	1	1
CO5	2	3	2	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSN31	STATISTICS FOR LIFE AND SOCIAL SCIENCES	EDC NME	6	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local		Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values	Other Values ✓

COURSE DESCRIPTION:

To introduce the basic statistical concepts and the basic statistical methods.

COURSE OBJECTIVES:

- To collect the data, frame the questions and to find the sample size.
- To calculate measures of central tendencies and variations,
- To get knowledge about probability.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	collect the data, frame the questions.	Upto K5
CO 2	find the sample size for their study and classify the samples.	Upto K5
CO 3	calculate the mean, median, mode, standard deviation for discrete as well as continuous data.	Upto K5
CO 4	define the probability and its axioms.	Upto K5
CO 5	some special probability distributions.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE



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STATISTICS FOR LIFE AND SOCIAL SCIENCES

UNIT– I:

Statistics – What and Why, Origin of Statistics, Growth of Statistics, Statistics Defined, Statistics: Science or Art, Functions of Statistics, Applications of Statistics, Limitations of Statistics, Distrust of Statistics, Statistical Methods vs Experimental Methods, Statistical Survey—An Introduction, Planning the Survey, Executing the Survey, COLLECTION OF DATA—Introduction, Primary and Secondary Data, Methods of Collecting Primary Data

Volume I – Chapter 1, 2, 3 (Simple problems only & Theorems not included)

UNIT– II:

SAMPLING AND SAMPLE DESIGNS—Introduction, Census and Sample Method, Theoretical Basis of Sampling, Essentials of Sampling, Methods of Sampling, Non-Probability Sampling Methods, Probability Sampling Methods, Size of Sample, Merits and Limitations of Sampling, Sampling and Non-Sampling Errors Classification And Tabulation Of Data—Introduction, Meaning and Objectives of Classification, Types of Classification, Formation of Discrete and continuous Frequency Distribution, Tabulation of Data, Parts of a Table, General Rules of Tabulation, Types of Tables.

Volume I – Chapter 4, 5 (Simple problems only & Theorems not included)

UNIT– III:

Average—Defined, Types of Averages, Arithmetic Mean, Calculation of Arithmetic Mean—Continuous Series Median, Calculation of Median —Continuous Series, Computation of Quartiles, Deciles, Percentiles, Etc. Significance of Measuring Variation, Range, The Interquartile Range or the Quartile Deviation, Merits and Limitations, The Standard Deviation.

Volume I – Chapter 7, 8 (Simple problems only & Theorems not included)

UNIT– IV:

Probability – Introduction, Classical or a Priori Probability, Shortcomings of the Classical Approach, Relative Frequency Theory of Probability, Subjective Approach to Probability, Axiomatic Approach to Probability, Importance of the Concept of Probability, Calculation of Probability, Theorems of Probability, Addition Theorem, Multiplication Theorem.

Volume II – Chapter 1(up to multiplication theorem). (Simple problems only & Theorems not included)

UNIT– V:

Mathematical Expectation, Random Variable and Probability Distribution, Binomial, Poisson and Normal Distributions.

Volume II – Chapter 1(Mathematical Expectation) & 2.

TEXT BOOK:

S. P. Gupta, *Statistical Methods*, Forty Sixth Revised Edition, Sultan Chand & Sons, New Delhi, 2021.

REFERENCE BOOK:

Statistical Methods by Dr. M. Manoharan, Palani Paramount Publications.

DIGITAL TOOLS:

https://alison.com/course/the-fundamentals-ofstatistics?utm_source=google&utm_medium=cpc&utm_campaign

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	2	1	3	1
CO2	1	2	1	3	1	1
CO3	2	2	2	2	3	1
CO4	1	2	2	3	2	1
CO5	1	1	3	2	3	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSN32	CELESTIAL SCIENCE	EDC NME	6	–	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local	Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender	Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

To introduce the basic mathematical concepts such as sequence, vectors, matrices used in Life sciences and give some applications in life science.

COURSE OBJECTIVES:

- To introduce about sequence, difference equations and limit.
- To gain knowledge about vectors.
- To discuss matrices and its applications.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the concepts of spherical trigonometry by using formulas and Analogies	Upto K5
CO 2	apply the idea to represent different system of coordinates of Celestial sphere diagrammatically and study the changes in the coordinates of the Sun during the year.	Upto K5
CO 3	understand different zones of earth and duration of night and day at different zones.	Upto K5
CO 4	mathematically derive the expression for Dip of the horizon and twilight	Upto K5
CO 5	verify Kepler's law of motion and derive Kepler's law of motion from Newton's law of gravitation.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE



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CELESTIAL SCIENCE

UNIT– I:

Spherical trigonometry – definitions – Theorems – problems – sine, cosine, cotangent, supplemental cosine, four parts formulae – functions of half of an angle and sides – Dealmbre's and Napier's analogies and Napier's rule and worked examples. (Chapter I: Pages 1 to 26 and 33 to 36)

UNIT– II:

Celestial sphere – definitions – Four system of coordinates – conversion of coordinates – relation between right ascension and longitude of the sun – changes in the coordinates of the sun in the course of the year – longitude of the sun on any day – sidereal time – theorems and worked examples. (Chapter II: pages 47 to 70)

UNIT– III:

Zone of Earth – variations in the duration of the day and night during the year at different systems – duration of perpetual day in a place of longitude greater than 90° and worked examples (Chapter III: pages 98 to 111 and 113 to 123)

UNIT– IV:

Dip of horizon – expression for dip – twilight – condition for twilight may last throughout night – the number of consecutive days having twilight throughout night – duration of shortest twilight and worked examples. (Chapter III: pages 135 to 141 and 144 to 151)

UNIT– V:

Kepler's law – verification of first and second law – Newton's deductions from Kepler's law – derive Kepler's third law from Newton's law of gravitation – fix the position of the planet in its elliptic orbit. (Chapter VI: pages 191 to 203 and 211 to 213)

TEXT BOOK:

Astronomy by Prof. S. Kumaravelu and Prof. Susheela Kumaravelu

Revised and enlarged edition – 2005.

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	2	3	1
CO2	2	2	2	2	3	1
CO3	2	2	2	3	2	1
CO4	2	2	2	2	3	1
CO5	1	2	3	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSS31	PROFESSIONAL COMMUNICATION SKILL	SEC	2	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	100	–	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local	Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender	Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

This Course is designed to focus on practical application and development of competencies essential for career advancement.

COURSE OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	develop Listening and Speaking on Communication	Upto K5
CO 2	focus on developing reading and writing on Communication	Upto K5
CO 3	develop Listening and Speaking on Description	Upto K5
CO 4	focus on developing reading and writing on Description	Upto K5
CO 5	improve life skills through SWOT analysis	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE



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PROFESSIONAL COMMUNICATION SKILL

UNIT– I: COMMUNICATION

Listening: Listening to audio text and answering questions – Listening Instructions.

Speaking: Pair work and small group work.

T1: Unit I

UNIT– II: COMMUNICATION

Reading: Comprehension passages – Differentiation between facts and opinion.

Writing: Developing a story with a picture.

T1: Unit I

UNIT– III: PRESENTATION SKILLS

Listening: Listening to lectures.

Speaking: Short Talks.

T1: Unit IV

UNIT– IV: PRESENTATION SKILLS

Reading: Reading Comprehension passages.

Writing: Writing recommendations, Interpreting Visual inputs.

T1: Unit IV

UNIT– V: LIFE SKILLS

Self Analysis through SWOT – How to do a SWOT Analysis. Goal setting based on Principle of SMART – SMART Goal setting & goal setting systems.

T2: Unit II

TEXT BOOKS:

1. *English for Physical Sciences – TANSCH*
2. *Soft Skills Book – Sourashtra College, Shanlax Press (2016) , Madurai.*

DIGITAL TOOLS:

<https://mrcet.com/downloads/MBA/Professional%20Communication%20Skills.pdf>

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	2	3	1
CO2	2	2	2	2	3	1
CO3	2	2	2	3	2	1
CO4	2	2	2	2	3	1
CO5	1	2	3	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE STRUCTURE – IV SEMESTER

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1	24PMSC41	Core – 11 : Functional Analysis	6	3	25	75	100	5
2	24PMSC42	Core – 12: Probability Theory	6	3	25	75	100	5
3	24PMSC43	Core – 13: Mechanics	6	3	25	75	100	5
4	24PMSCV1	Core – 14: Project with Viva–Voce	5	3	40	60	100	5
5	24PMSE41	Elective – 6*: Resource Management Techniques	4	3	25	75	100	3
	24PMSE42	Financial Mathematics						
6	24PMSS41	SEC: Professional Competency Skill Enhancement course	3	Internal Assessment Max. Marks 100			100	2
		TOTAL	30				600	25

***Choose any one subject from Elective 6**

CA – Class Assessment (Internal)

SE – Summative Examination

SEC – Skill Enhancement Course

NME – Non – Major Elective

T – Theory

P – Practical



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSC41	FUNCTIONAL ANALYSIS	CORE – 11	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability		✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local		Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

Functional Analysis is a branch of Mathematics that deals with the study of vectors spaces with limit structure such as a norm or inner product and the functions and operators defined on those spaces.

COURSE OBJECTIVES:

- To provide students with a strong foundation in functional analysis, focusing on spaces, operators and fundamental theorems.
- To develop student's skills and confidence in mathematical analysis and proof techniques.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the Banach spaces and Transformations on Banach Spaces and to prove Hahn Banach theorem	Upto K5
CO 2	prove open mapping theorem and to discuss about the conjugate of an operator.	Upto K5
CO 3	discuss orthogonal, orthogonal complements and orthonormal sets.	Upto K5
CO 4	discuss Hilbert spaces and conjugate of an operator and study about normal and unitary operators	Upto K5
CO 5	learn about Finite-Dimensional Spectral Theory.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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FUNCTIONAL ANALYSIS

UNIT– I:

Banach Spaces: Definition and some examples – Continuous Linear Transformations – The Hahn–Banach theorem. (Chapter–9 Sections 46, 47, 48)

UNIT– II:

Banach Spaces: The natural imbedding of N in N^{**} – The open mapping theorem – Closed Graph theorem – Uniform Bounded theorem – The conjugate of an operator. (Chapter–9 Sections 49, 50, 51)

UNIT– III:

Hilbert Spaces: The definition and some simple properties – Orthogonal – Orthogonal Complements – Orthonormal sets – Bessel's inequality – Schwartz's inequality – Gram Schmidt Orthogonalization Process. (Chapter–10 Sections 52, 53, 54)

UNIT– IV:

Hilbert Spaces: The Conjugate space H^* – the adjoint of an operator – self – adjoint operators – Normal and Unitary operators. (Chapter–10 Sections 55, 56, 57, 58)

UNIT– V:

Finite-Dimensional Spectral Theory: Matrices – Determinants and the Spectrum of an operator – The Spectral Theorem. (Chapter–11 Sections 60, 61, 62)

TEXT BOOK:

G.F. Simmons, *Introduction to Topology and Modern Analysis*, McGraw Hill Education (India) Private Limited, New Delhi, 1963.

REFERENCE BOOKS:

1. W. Rudin, *Functional Analysis*, McGraw Hill Education (India) Private Limited, New Delhi, 1973.
2. B.V. Limaye, *Functional Analysis*, New Age International, 1996.
3. C. Goffman and G. Pedrick, *First course in Functional Analysis*, Prentice Hall of India, New Delhi, 1987.
4. E. Kreyszig, *Introductory Functional Analysis with Applications*, John Wiley & Sons, New York, 1978.
5. M. Thamban Nair, *Functional Analysis*, A First course, Prentice Hall of India, New Delhi, 2002.

DIGITAL TOOLS:

<https://mathforums.com>, <http://en.wikipedia.org>

https://ocw.mit.edu/search/?d=Mathematics&q=functional%20analysis&s=department_course_numbers.sort_coursesum, <http://www.opensource.org>

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	3	2	3	2
CO2	2	1	3	1	3	1
CO3	3	2	3	1	3	1
CO4	1	2	3	2	3	2
CO5	3	1	2	3	3	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSC42	PROBABILITY THEORY	CORE – 12	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship	
	National	✓	Local	Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender	Environment and Sustainability		Human Values	Other Values ✓

COURSE DESCRIPTION:

To introduce definition of probability theory, to study joint probability, to study about the Regression types, to study about the characteristic function and to study about discrete and continuous probability distribution functions and their properties.

COURSE OBJECTIVES:

To introduce probability theory, to study some statistical characteristics, discrete and continuous distribution functions and their properties, and characteristic function

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the concept of Probability, distribution function and types random variable, expectations.	Upto K5
CO 2	define Joint Distribution function, Conditional distributions, Expectations and Independent Random Variables.	Upto K5
CO 3	define Absolute moments, to solve Regression of the first and second type.	Upto K5
CO 4	define Characteristic functions, to define distribution function and to solve problems applying characteristic functions.	Upto K5
CO 5	discuss special distributions	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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PROBABILITY THEORY

UNIT– I:

Probability and Distributions: The Probability Set Function – Conditional Probability and Independence – Random Variables of the Discrete Type – Random Variables of the Continuous Type – Properties of the Distribution Function – Expectation of a Random Variable – Some Special Expectations – Chebyshev's Inequality.

Chapter–1 Sections 1.3 – 1.10 Page no. 26 – 84

UNIT– II:

Multivariate Distributions: Distribution of Two Random Variables –Conditional Distributions and Expectations –Independent Random Variables – Extension to Several Random Variables.

Chapter–2 Sections 2.1 – 2.2, 2.4 –2.5 Page no. 88 – 95

UNIT– III:

Parameters of the Distribution: Absolute moments – Order Parameters – Moments of random vectors.

Chapter–3 Sections 3.4 – 3.6 Page no.76 – 91

UNIT– IV:

Characteristic function: Properties of Characteristic function – Characteristic function and Moments – Semi-invariants – Characteristic function of the sum of the Independent Random Variables.

Chapter–4 Sections 4.1 – 4.4 Page no. 105 – 115

UNIT– V:

Some Special Distributions: The Binomial and Related Distributions – The Poisson Distribution – The Gamma and Chi-Square Distributions – The Normal Distribution.

Chapter–3 Sections 3.1 – 3.4 Page no. 130 – 158

TEXT BOOK:

1. **Introduction to Mathematical Statistics** by Robert V. Hogg and Allen T. Craig, Pearson Education (Singapore), Fifth Edition, 2005. (Unit 1, Unit 2 and Unit 5)
2. **Probability Theory and Mathematical Statistics** by M. Fisz, John Wiley and Sons, New York, 1963. (Unit 3 and Unit 4)

REFERENCE BOOKS:

1. R.B. Ash, **Real Analysis and Probability**, Academic Press, New York, 1972.
2. K.L.Chung, **A Course in Probability**, Academic Press, New York, 1974.
3. R.Durrett, **Probability: Theory and Examples**, (2nd Edition) Duxbury Press, New York, 1996.
4. V.K.Rohatgi. **An Introduction to Probability Theory and Mathematical Statistics**, Wiley Eastern Ltd., New Delhi, 1988(3rd Print).
5. S.I.Resnick, **A Probability Path**, Birhauser, Berlin, 1999.
6. B.R.Bhat , **Modern Probability Theory** (3rd Edition), New Ag.



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DIGITAL TOOLS:

<https://mathforums.com>

https://ocw.mit.edu/search/?d=Mathematics&q=functional%20analysis&s=department_course_numbers.sort_coursenum

<http://www.opensource.org>

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	3	2	3	1
CO2	2	1	3	1	3	1
CO3	3	2	3	1	3	1
CO4	1	2	3	2	3	2
CO5	3	1	2	3	3	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSC43	MECHANICS	CORE – 13	6	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local		Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values	Other Values ✓

COURSE DESCRIPTION:

This course is designed to learn various concepts and Definition used to learn Mechanics.

COURSE OBJECTIVES:

To study mechanical systems under generalized coordinate systems, virtual work, energy and momentum, to study mechanics developed by Newton, Langrange, Hamilton Jacobi

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	list out different types of constraints.	Upto K5
CO 2	illustrate various principle and apply calculus of variation techniques to problems.	Upto K5
CO 3	derive Lagrange equation.	Upto K5
CO 4	apply viral theorem to derive special cases.	Upto K5
CO 5	explore and derive Hamilton–Jacobi Equation	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE



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MECHANICS

UNIT– I:

Mechanics of a particle– Mechanics of a system of particles – Generalized coordinates — work Energy and Momentum (Linear and Angular momentum) – Constraints

(Chapter 1 : Sections 1.1 to 1.3)

UNIT– II:

Virtual Work – D'Alembert's Principles –Lagrange's Equations – Velocity dependent Potentials – Dissipation function – Derivation of Lagrange's equation from D'Alembert's Principle – Some techniques of calculus of variations

(Chapter 1 : Sections 1.4 , 1.5 & Chapter 2 : Section 2.2, 2.3)

UNIT– III:

Hamilton's Equations : Hamilton's Principle – Derivation of Lagrange's equation from Hamilton's Principle – Extension of Hamilton's principle to Non Holonomic system

(Chapter 2 : Sections 2.3 to 2.4)

UNIT– IV:

Reduction to an equivalent one body problem– equation of motion and first integral– Classification of orbit– Virial theorem

(Chapter 3 : Sections 3.1 to 3.4)

UNIT– V:

Hamilton–Jacobi Theory – Hamilton Principle function – The Hamilton oscillator problem as an example of the Hamilton – Jacobi method – The Hamilton Jacobi Equation for Hamilton's Characteristic Function

(Chapter 10 : Sections 10.1 to 10.3)

TEXT BOOK:

H. Goldstein, *Classical Mechanics*, (2nd Edition) Narosa Publishing House, New Delhi.

REFERENCE BOOKS:

1. N.C. Rane and P.S.C. Joag, *Classical Mechanics*, Tata McGraw Hill, 1991.
2. Ubadhyaya *Classical Mechanics* Himalaya publishing House, New Delhi 2019
3. D. Greenwood, *Classical Dynamics*, Prentice Hall of India, New Delhi, 1985.

DIGITAL TOOLS:

<http://mathforum.org>,
<http://ocw.mit.edu/ocwweb/Mathematics>,
<http://www.opensource.org>,
www.physicsforum.com

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1	2	1	3	2
CO2	2	3	1	3	1	1
CO3	3	2	2	2	2	1
CO4	1	1	1	1	1	2
CO5	2	2	3	3	3	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSCV1	PROJECT WITH VIVA – VOCE	CORE – 14	5	–	5

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	40	60	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local		Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values	Other Values ✓

COURSE DESCRIPTION:

Students work in teams to define, analyze implement and evaluate real-world problems.

COURSE OBJECTIVES:

To make the students

- understand and develop the skills to prepare a project.
- analyze the new concepts in Mathematics apart from the Syllabus.
- develop self-learning and problem-solving skills.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	develop the skills to prepare project	Upto K5
CO 2	demonstrate the stages involved in Project development	Upto K5
CO 3	analyze the projects	Upto K5
CO 4	know report writing methodology.	Upto K5
CO 5	have the knowledge to describe their work.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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Rules governing the evaluation Project & Viva – Voce

1. The number of pages in the project may be 40 to 50. The report of the project must be in the prescribed form. It should be typed neatly either in MS Word or LaTeX.
2. Students can select a problem of their choice pertaining to their course, in consultation with the guide assigned to them.
3. The project report should be submitted to the Department on or before the date fixed by the Controller of Examinations.
4. Each student has to submit two copies of his/her project report for evaluation.
5. Evaluation Method for Project:

	Maximum Marks		Credits
	Internal	External	
Project	20	30	5
Viva Voce	20	30	
Total	100		5

6. For awarding Internal Marks, there will be 3 reviews. In each review the candidate has to present his/her project and has to attend viva voce. Each review will be evaluated for 40 marks and the average of three reviews will be the internal mark of the candidate.
7. The students are only allowed to attend the external viva-voce if they have qualified in both internal and external project evaluation. The viva-voce carries a maximum of 40 marks and it will be conducted jointly by the internal examiner and the external examiner.
8. Passing minimum:
 - No minimum for internal marks.
 - 50 out of 100 or 50% in aggregate (Internal + External) is the passing minimum.

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	3	2
CO2	2	2	3	2	3	2
CO3	3	3	3	2	3	2
CO4	3	3	3	3	2	2
CO5	3	2	2	3	3	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSE41	RESOURCE MANAGEMENT TECHNIQUES	ELECTIVE – 6	4	–	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local		Regional		Global	
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values	Other Values ✓

COURSE DESCRIPTION:

This course is designed to make the students understand the concepts of PERT, CPM and Non LPP problems.

COURSE OBJECTIVES:

Formulating the shortest route and determining optimal solution, Constructing the project network, Analysing pure birth model, pure death model and poisson queuing model, Determining maxima and minima points for unconstrained and constrained functions, Solving non LPP using various methods.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	find shortest route using various algorithms	Upto K5
CO 2	find critical path and determining floats	Upto K5
CO 3	develop mathematical and modeling skills required to evaluate queuing systems	Upto K5
CO 4	use Jacobian and Lagrangian methods for problems with equality constraints, KKT conditions for problems with inequality constraints	Upto K5
CO 5	solve unconstrained problems using Direct search method and Gradient method	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY, K4 – ANALYZE, K5 – EVALUATE



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RESOURCE MANAGEMENT TECHNIQUES

UNIT- I:

Scope of Network applications – Definitions – Minimal spanning tree algorithm – Shortest route problems using cyclic and acyclic algorithms (Dijkstra method)

Chapter 6– Section 6.1 to 6.4, 6.4.2

UNIT- II:

CPM and PERT Network representation – critical path computations – Determination of floats – Total float and free float – PERT Networks.

Chapter 6 – Section 6.7, 6.7.1, 6.7.2 & 6.7.3.

UNIT- III:

Why study queues? – Elements of queuing models – Role of exponential distribution – Pure birth and death models – Generalized Poisson queuing models – steady state measures of performance – Specialized Poisson queue – $(M / M / 1) : (GD / \infty / \infty) - (M / M / 1) : (GD / N / \infty)$.

Chapter 17 – Section 17.1 to 17.3, 17.3.1, 17.4, 17.4.1, 17.4.2, 17.5, 17.6, 17.6.1, 17.6.2.

UNIT- IV:

Classical optimization theory – Unconstrained problems – Necessary and sufficient conditions – Newton Raphson method – Constrained problems – Equality constraints by Lagrangian method and Karush Kuhn Tucker (KKT) conditions. (Simple problems only)

Chapter 20 – Section 20.1, 20.2, 20.2.1, 20.2.2, 20.3, 20.3.1,

Lagrangian method– eg. 20.3.4 & 20.3.5 only. KKT conditions eg. 20.3.7.

UNIT- V:

Non – linear programming – Unconstrained algorithms – Direct search method – Gradient method – Constrained algorithm – Quadratic programming model. (simple problems only)

Chapter 21 – Section 21.1, 21.1.1, 21.1.2, 21.2, 21.2.2.

TEXT BOOK:

An Introduction to Operations Research – 6th edition by H. A. TAHA.

DIGITAL TOOLS:

https://en.m.wikipedia.org/wiki/Program_evaluation_and_review_technique

https://en.m.wikipedia.org/wiki/Birth%E2%80%93death_process

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	1	2	2
CO2	3	3	1	2	3	1
CO3	2	2	2	1	2	1
CO4	1	3	3	1	3	2
CO5	1	3	2	2	1	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSE42	FINANCIAL MATHEMATICS	ELECTIVE – 6	4	–	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

Curriculum Design and Development	Employability	✓	Skill Oriented		✓	Entrepreneurship		
	National	✓	Local	Regional		Global		
Curriculum Enrichment	Professional Ethics		Gender	Environment and Sustainability		Human Values	Other Values	✓

COURSE DESCRIPTION:

This course is designed to make the students understand the financial markets and various types of models like finite market model, Black Scholes model.

COURSE OBJECTIVES:

To impart the knowledge of active and practical use of mathematics which includes Stochastic Integrals, binomial models, Black–Scholes models

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	analyze Browian motion and evaluate stochastic integrals.	Upto K5
CO 2	gain knowledge about the financial markets.	Upto K5
CO 3	demonstrate the finite market model and incomplete markets.	Upto K5
CO 4	construct Black–Scholes model.	Upto K5
CO 5	formulate the multi–dimensional Black–Scholes model.	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE



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FINANCIAL MATHEMATICS

UNIT– I:

Brownian Motion – Stochastic Integrals – Ito process – Ito formula – Grisanov Transformation and martingale representation theorem.

UNIT– II:

Financial markets – Derivatives – Binomial models – Pricing European and American Contingent claim.

UNIT– III:

Definition of the finite market model – first and second fundamental theorems of asset pricing – pricing European contingent claims – incomplete markets – separating hyperplane theorems.

UNIT– IV:

Black Scholes models – Equivalent Martingale measure – European contingent claims – pricing European contingent claims – European call options – Black Scholes formula – American contingent claims – American call and put options.

UNIT– V:

Multidimensional Black Scholes model – first and second fundamental theorems of asset pricing – form of equivalent local martingale measures – pricing European contingent claims and incomplete markets.

TEXT BOOK:

R. J. Williams, *Introduction to Mathematical Finance*, American Mathematical Society – 2006.

REFERENCE BOOK:

Steaphen Garrett, *An Introduction of Mathematics of Finance*; A deterministic approach, Butterworth – Heinemann limited second revised edition.

DIGITAL TOOLS:

<https://onlinecourses.nptel.ac.in/noc19ma26/preview>

<https://corporatefinanceinstitute.com/resources/data:science/financial-mathematics/>

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	1	2	2
CO2	3	3	1	2	3	1
CO3	2	2	2	1	2	2
CO4	1	3	3	1	3	2
CO5	1	3	2	2	1	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level



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COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
24PMSS41	PROFESSIONAL COMPETENCY SKILL ENHANCEMENT COURSE	SEC	3	–	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	100	–	100

Curriculum Design and Development	Employability		✓	Skill Oriented		✓	Entrepreneurship			
	National	✓	Local		Regional		Global			
Curriculum Enrichment	Professional Ethics		Gender		Environment and Sustainability		Human Values		Other Values	✓

COURSE DESCRIPTION:

This Course is designed to focus on practical application and development of competencies essential for career advancement.

COURSE OBJECTIVES:

- To develop the language skills of students by offering adequate practice in professional contexts.
- To focus on developing students' knowledge of domain specific registers and the required language skills.
- To develop strategic competence that will help in efficient communication
- To sharpen students' critical thinking skills and make students culturally aware of the target situation.

COURSE OUTCOMES (COs):

After the completion of the course, the students will be able to

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	develop employability skills – types of interviews	Upto K5
CO 2	focus on preparation for interview	Upto K5
CO 3	know about stress – overcome stress	Upto K5
CO 4	focus on listening and speaking of critical thinking skills	Upto K5
CO 5	improve reading and writing on critical thinking skills	Upto K5

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY,
K4 – ANALYZE, K5 – EVALUATE

Passed in the BoS Meeting held on 27/02/2025

Signature of the Chairman



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PROFESSIONAL COMPETENCY SKILL ENHANCEMENT COURSE

UNIT– I: EMPLOYABILITY SKILLS

Interview Skills – Types of Interview – Group Interview, Panel Interview, Telephonic Interview – Other types of Interview – Behavioral Interview, Case Interview, On–Site Interviews – Video Conference Interview.

T2: Unit II (Page : 42 to 48)

UNIT– II: PREPARATION FOR INTERVIEW

Preparation for Interview – A review hours before, During the Interview, Closing the Interview – Mock Interview.

T2: Unit II (Page : 48 to 62)

UNIT– III: STRESS MANAGEMENT

Stress – Symptoms of Job stress – How to overcome stress.

T2: Unit V (Page : 83 to 96)

UNIT– IV: CRITICAL THINKING SKILLS

Listening: Listening Comprehension – Listening for information.

Speaking: Making Presentations (with PPT – practice).

T1: Unit V

UNIT– V: CRITICAL THINKING SKILLS

Reading: Comprehension passages – Note making. Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills

Writing: Problem and Solution Essay – Creative writing – summary writing.

T2: Unit V

TEXT BOOKS:

1. *English for Physical Sciences – TANSCHÉ*

2. *Soft Skills Book – Sourashtra College, Shanlax Press (2016), Madurai.*

DIGITAL TOOLS:

<https://mrcet.com/downloads/MBA/Professional%20Communication%20Skills.pdf>

Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	2	3	1
CO2	2	2	2	2	3	1
CO3	2	2	2	3	2	2
CO4	2	2	2	2	3	2
CO5	1	2	3	2	2	1

3. Advanced Application 2. Intermediate Development 1. Introductory Level